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ABSTRACT

The process of initiating and negotiating a literature search in the Educational Resources Information Center (ERIC) data base is discussed in laymen's terms. The guide offers suggestions on choosing a data base, deciding whether to use computerized or manual retrieval, defining the search problem, and understanding the Boolean search strategy used in computer searches; it also presents a synthesis of the ERIC indexing guidelines that affect computer searches. Appendixes include a list of data bases of interest to educators, a list of educational level descriptors used in ERIC, a glossary, and a bibliography. (JY)

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HOW TO PREPARE FOR A COMPUTER SEARCH OF ERIC:

A NON-TECHNICAL APPROACH

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ERIC Clearinghouse on Information Resources

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INTRODUCTION

The computer revolution has come to the national Educational Resources Information Center (ERIC) system, along with many other areas of education. The Survey of ERIC Data Base Search Services (Embry, 1974) lists over 120 organizations currently providing computerized searches of the ERIC data base. The list is growing at a rapid rate; some public libraries are even joining in a pilot study to offer the service to the public at large (Ahlgren, 1974).

With the growth of computerized information retrieval from ERIC, the number of educators who request such services grows. It is important that these educator/requestors become somewhat sophisticated about the process of computerized retrieval and the ERIC data base in order to improve the relevance and scope of their searches. Similarly, the "information broker" (usually a librarian or school administrator) who channels a search request from the educator to a search service must be aware of how a computer search is prepared so that he/she will be able to help with the process.

It is with these two audiences in mind that this monograph is written. The work is not intended to be a tutorial for the sophisticated searcher who processes several searches a day; rather it is an attempt to describe in non-technical language the steps involved in preparing a computer search for ERIC.

INITIATING A SEARCH

Choice of Data Base

One of the first considerations is to decide whether ERIC is the most appropriate data base to query. ERIC specializes in noncopyrighted, unpublished materials about education at all grade levels and all subject areas. If the question is psychologically oriented it might be better to choose the Psychological Abstracts data base. If it is vocational in orientation, then the AIM/ARM file might be of more interest. If there are very technical aspects, the NTIS data base offers reports of government funded research in the scientific technical field. *

There are at least two ways to decide on the appropriate data base. If the person doing the search (negotiator) has experience using various data bases, then his/her advice can be relied upon. However, if the requestor is unable to discuss the problem directly with the negotiator, then a look through a few issues of ERIC's Resources in Education and Current Index to Journals in Education should help in reaching a decision.

In some cases, searching of more than one data base may be desirable and/or necessary to provide both relevance and scope to the search response.

Computerized or Manual Search?

Having decided that ERIC is the appropriate file, one must then decide whether a computer search is the best approach. There are some instances when a computer search is imperative, such as when the question is multifaceted and requires a coordination of concepts. An example of this type of question

* See Appendix A for a more complete listing of alternative data bases.

might be: What is the effect of educational television on bilingual children of elementary school age? This question has at least three facets: educational television, bilingualism, and elementary school children. A manual (or hand) search would be exceedingly time consuming, if indeed it could do the job at all.

Another instance of a useful computer search is an in-depth retrospective literature review. If the topic were "tests and testing" and the searcher made a hand search of everything published about the topic in ERIC, he/she would have to look through each annual volume of RIE for items listed under "Tests" and "Testing" and then look up each associated resume. The searcher would then have to check items indexed under specific types of tests, such as Intelligence Tests, Psychological Tests, and Preschool Tests. (The ERIC system does not index specific items under their general heading.) This process would be extremely time consuming without a computer.

Yet another instance of an appropriate computer search is "text searching." Text searching, available on some computer systems, allows searching of ERIC titles and abstracts for any word or phrase, whether or not it is in the controlled vocabulary of the ERIC Thesaurus. A requestor who wants to know when a given word or concept begins to appear in the literature, or who wants to examine the literature in depth for a given concept that is not yet an ERIC descriptor would probably find computer text searching the only answer. Because of its many capabilities, text searching will undoubtedly increase in both importance and use in coming years.

Because computer searching has an aura of glamor and authority attached to it, it can be overused. A search that is relatively simple to perform (i.e. specific writings of a particular author or examination of a narrow topic) can probably best be done manually. Using a computer in fact lessens the possibility of finding interesting material serendipitously.

SEARCH NEGOTIATION

Type of Search

When the searcher and the requestor have settled questions of data base and searching method, the next consideration is whether the search will be: 1. retrospective; 2. in answer to a specific question; or 3. for current awareness.

The retrospective search recovers all the information on a given topic in the entire data base.

A search on a specific question must be precisely defined and must consider various ways to find a possibly elusive answer.

The current awareness search, sometimes called a Selected Dissemination of Information (SDI), establishes a profile of interest that is run periodically on new additions to the data file only (not retrospective). This search is carefully tailored to fit the requestor's needs and is supplied to the requestor on a continuing basis.

Defining the Problem

The next step in setting up a search is carefully defining the problem or question. The process is ideally carried on face-to-face between the requestor and the searcher. If this cannot be accomplished, the phone is the next best tool. When personal or phone contact are not possible, this phase is sometimes carried on by mail. However, relevancy of response is usually low when a mailed request is processed on face value, unless it has been submittted by a trained intermediary.

The requestor is encouraged to describe the search topic in natural language and at some length. He/she is asked to state the question as clearly and concisely as possible and to tell what information is not wanted as well as what is needed, taking into account leveling, target population or audience, particular authorities or institutions whose work is respected, sources already considered, and appropriate time frame (e.g. nothing prior to 1970.) Often, in talking over the question, the requestor will be able to refine the topic greatly. This is particularly true when he/she is a novice at computer searches.

It is highly desirable for the requestor to indicate how much information can and will be used. The ERIC system usually has more than enough references, and the real problem is knowing when to stop and how much to provide to the requestor.

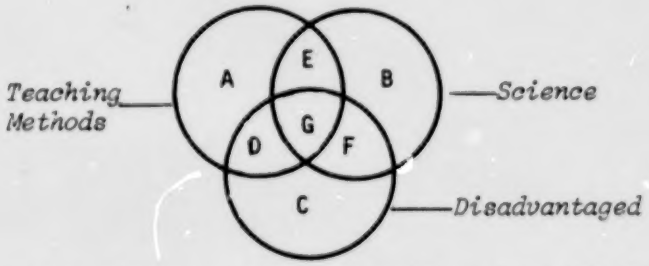
The requestor should take time to focus the topic of the request, to examine in depth what information is needed, and to determine what information is already available. It helps to try and set up the problem in terms of concepts; that is, to try to think in terms of the facets of the question rather than just the expected answer. For instance, it is better to think in terms of "What is the most effective method to teach mathematics to elementary school students who are bilingual?" rather than "What do I do with children who don't speak English?"

During this phase, it is important to understand that topical negotiation cannot be completed until the requestor has been provided with some assurances as to what he/she can expect to receive, and in what kind of format.

It is easier to understand the idea of setting up a search question if one knows that computer search strategy is based on the concept of Boolean algebra. Boolean algebra is relatively easy to understand, even though it can be used to perform many higher level mathematical manipulations.

Boolean Search Strategy

The strategy used in searching with the aid of a computer is generally based on set theory and Boolean logic. Drawn below is a Venn diagram consisting of three overlapping circles, A,B, and C. The areas of overlap of each pair of circles are (E&G), (D&G), and (F&G). The area of overlap for all three circles is called G.



As an example, let us assume that a requestor has asked for information on teaching methods for the disadvantaged in the science area. Circle A could represent the reports in ERIC indexed by the descriptor Teaching Methods, Circle B those indexed by Science and Circle C those indexed by Disadvantaged. The areas of overlap (E&G), (D&G), and (F&G) then represent those documents indexed by any pair of descriptors and Area G represents those indexed by all three descriptors. In phrasing a search question concerning material on methods of teaching science to the disadvantaged, the searcher might say he wants those documents indexed by both the terms Teaching Methods and Disadvantaged, which are those documents in Areas D and G. Or the searcher might ask for documents indexed by Teaching Methods and either Disadvantaged or Science. This would be those documents in Areas D, E, and G. If the searcher decided to look at documents indexed by Teaching Methods and Science, but not in the area of the Disadvantaged, this would

be those in both A and B but not in C, resulting in Area E only, excluding area G. A search for items indexed by all three of the terms Teaching Materials, Disadvantaged, and Science would restrict itself to Area G. All combinations are based on the Boolean logical operators AND, OR, NOT. "AND" indicates those things common to two or more groups, "OR" those things in two or more groups, whether or not in common, and "NOT" those things not in a particular group or groups.

When performing a computer search, one is defining all the material included in each of these circles. The material in each circle is usually called a "set." For instance, the search discussed above might be built up in part as follows: Set A (Circle A) would include material indexed under the ERIC descriptors Teaching Methods, Teaching Techniques, Effective Teaching, Teaching Procedures, and Educational Strategies. The computer would sort through all the ERIC citations, storing those that had the specified descriptors and dropping out duplications. Set C might be defined as those ERIC citations indexed with the descriptors Disadvantaged Youth, Culturally Disadvantaged, Economically Disadvantaged, Socially Disadvantaged, and Low Income Groups. The computer would again sort through all the ERIC citations, storing those that met these specifications. The computer would then compare the citations in Set A with those in Set C. If a citation appeared in both sets (areas D and G), it should meet the criteria of containing information about some aspect of teaching some segment of the disadvantaged population. The same type of building would occur with Set B, Science, using descriptors such as Science Instruction, Biology Instruction, Chemistry Instruction, and Science Courses.

These sortings and comparisons can be done in a matter of seconds by the computer. Computer searching systems vary in their approach to performing Boolean operations, but the method of defining the sets and the results are the same from the viewpoint of the requestor.

The above example illustrates that an understanding of ERIC indexing is important to anyone preparing a search strategy.

ERIC Indexing

The ERIC system classifies its reports in four basic ways: by Author, by Institution, by Descriptor, and by Identifier. The first two ways are familiar to those who have done any other literature searching. The latter two may be unfamiliar. The ERIC system uses a "controlled vocabulary" when indexing a document. That is, the information specialists who prepare the abstracts and assign retrieval terms to the document must choose these terms from the authority list called The Thesaurus of ERIC Descriptors. In ERIC, these terms are called descriptors. In other systems, they are called subject headings, key words, or index terms. Identifiers are those terms which reflect the content of the document, but are not found in the ERIC Thesaurus. They are, for the most part, the names of specific people, geographical locations, trade names and projects. Other categories that appear as identifiers are acronyms, coined terminology, equipment names, organizations, and specific theories.

Any of these four basic methods of classification may be used to locate citations in ERIC. For instance, if a certain author writes about a given topic 90% of the time, the requestor need only specify that author's name to retrieve sufficient information to answer the question. Similarly, certain institutions always deal with the same types of issues, and specifying these institutions will retrieve sufficient material.

But by far the most common approach to ERIC material is subject-oriented, using the ERIC descriptors and identifiers to define subject areas. Because of this, requestors and searchers should be familiar with how ERIC indexes its materials. Following is a summary of the ERIC indexing rules.

Summary of Significant Indexing Rules

1. Descriptors used in the indexing process must be in the Thesaurus of ERIC Descriptors.
2. The Identifier Field should be used to index specific entities, such as geographic locations, project names, etc.
3. The "major" subject matters of the document, whether expressed as Descriptors or Identifiers, must be asterisked (*) in order to distinguish them from the less substantial or "minor" topics.
4. At least one (1) major Descriptor must be assigned to a document; not more than five (5) major Descriptors are permitted for each document. There is, however, no upper limit on the total number of Descriptors that can be used to index a given document; the average through 1973 for RIE is around eleven (11).
5. There is no minimum requirement for Identifiers; no more than one (1) Identifier should be designated as major.
6. Index to the specific level of subject matter covered by the document. Do not automatically index "up" to higher generic levels than the document actually deals with. Do not automatically index "down" to all the sub-elements of the level dealt with.

7. Index in depth, or exhaustively, all significant concepts covered in the document.

8. Index the document and exposition in hand; avoid indexing implications, possible uses, and other aspects referred to, but not actually dealt with.

9. Index on the basis of the entire document, not just a part such as the Introduction or Conclusions.

10. The indexer must always keep in mind the checklist of indexable elements:

- Population Concepts
  - Educational (i.e. Grade/Academic) Level
  - Other Groupings
- Activities/Action Concepts, Methodology/Material Concepts
- Curriculum Concepts
- Document Form/Type

Three of these rules need further elaboration in order to understand how they bear on structuring an ERIC search: The rules about identifiers (Rule 2), about indexing specificity (Rule 6), and about indexable elements (Rule 10).

Identifiers

Proper names of persons, geographical locations, trade names, projects, and the like are frequently part of a document's indexable information. These highly specific terms (multitudinous and often transient) usually are not appropriate for the Thesaurus. Nevertheless, they can be highly useful access points for the users and must be taken into account in the indexing process. The ERIC solution to this problem is to create a relatively "free" and open subject indexing field called the identifier field. Identifiers are not rigidly defined, structured, and controlled like descriptors. Some categories of

identifiers are acronyms, coined terminology, equipment names, geographic locations, theories, personal names, projects, tests, trade names, organizations and the like.

Indexing Specificity

ERIC guidelines call for indexing to "the level of specificity of the document in hand." In practice this means that a document about cable television would be indexed with the term Cable Television and not with the broader term Television. As with any rule there are exceptions: When a document discusses a concept at both a general and a specific level (e.g. a document describing intelligence tests in general and specific tests as well); when a document discusses a specific concept, but the indexer thinks the document adds useful information to the body of knowledge about the general concept; or when a document discusses many specifics of a general concept, but none in sufficient detail to merit the indexing of each specific concept. Knowing this, the searcher must be careful to choose not only those broad terms that cover the topic but also the narrower terms that are included in the more general area. For instance, when the searcher is interested in Television, all the specific kinds of television that may be of interest must also be specified if the search is to retrieve items which deal with these sub-areas specifically, i.e. Closed Circuit Television, Color Television, Cable Television, Fixed Service Television, etc.

Indexable Elements

Each document in ERIC is indexed based on these four concepts.

1. Population Concepts*

Population concepts categorize and identify the group or individual studied by the report or intended as the users of the report. Most important to ERIC users are terms identifying the grade level/instructional program level/academic level of the group. However, other categories which may be applicable are: age, occupation, race, nationality, religion, intelligence or ability level, physical or emotional characteristics, socio-economic characteristics, involvement in a particular study or program etc.

Examples of a few terms from the Thesaurus which represent these various population concepts follow:

Age	- e.g.,	INFANCY	(0 - 3)
		EARLY CHILDHOOD	(4 - 6)
		CHILDHOOD	(7 - 12)
		ADOLESCENCE	(13 - 17)
		YOUNG ADULTS	(18 - 30)
		ADULTS	(31 - 65)
		OLDER ADULTS	(over 65)

Occupation - e.g., CARPENTERS
CHEMISTRY TEACHERS
COOKS
COUNSELORS
LIBRARIANS
MEDICAL LABORATORY ASSISTANTS
OPTOMETRISTS
TEACHERS

NOTE: See also list of Narrower Terms under term OCCUPATIONS.

*For more information, consult Appendix B.

Race/Nationality - e.g.,

AMERICAN INDIANS
ANGLO AMERICANS
ARABS
CAUCASIAN RACE/CAUCASIANS
CHINESE AMERICANS
ESKIMOS
FILIPINO AMERICANS
INDIANS
ITALIAN AMERICANS
JAPANESE AMERICANS
JEWS
KOREAN AMERICANS
MEXICAN AMERICANS
MEXICANS
NEGROES
POLISH AMERICANS
PUERTO RICANS
SPANISH AMERICANS

Religion - e.g.,

AMISH
BRAHMINS
CATHOLICS
CHRISTIANITY
ISLAMIC CULTURE
JUDAISM
PROTESTANTS
PURITANS

Intelligence/Ability Level - e.g.,

ABLE STUDENTS
GIFTED
HANDICAPPED
HIGH ACHIEVERS
ILLITERATE ADULTS
MENTALLY HANDICAPPED
SUPERIOR STUDENTS
TALENTED STUDENTS

Physical/Emotional Characteristics - e.g.,

AMPUTEES
BLIND
DEAF
DEAF BLIND
EMOTIONALLY DISTURBED
HANDICAPPED
HOSTILITY
HYPERACTIVITY
MONGOLISM
NEUROLOGICALLY HANDICAPPED
PARANOID BEHAVIOR
PHYSICALLY HANDICAPPED
PSYCHOSIS
QUADRIPLEGIA
SCHIZOPHRENIA

Socioeconomic Characteristics - e.g.,

ADOPTED CHILDREN
CRIMINALS
DELINQUENTS
ECONOMICALLY DISADVANTAGED
FOSTER CHILDREN
MIGRANTS
NOMADS
PRISONERS
REFUGEES
SOCIALLY DISADVANTAGED
SOCIALLY MALADJUSTED

2. Action Concepts and Material Concepts

Activities or action concepts include Teaching, Testing, Experimentation, and the like. Examples of methodology and materials concepts are Language Laboratories, Programed Texts, Filmstrips, etc.

3. Curriculum Concepts

This refers to the educational subject or concept which is being administered, taught, or measured. Examples are Arithmetic, History, Learning Disabilities, Reading, Spatial Perception, and the like.

4. Document Form/Type Concepts

A valid indexing concern is to record whether a document is a bibliography, textbook, curriculum guide, etc. A searcher may find it helpful to think about what form of document is useful in answering a specific question.

Listed below are some of the "form" terms used in ERIC.

ABSTRACTS
ADMINISTRATOR GUIDES
ANNOTATED BIBLIOGRAPHIES
ANNUAL REPORTS
ATLASES
BIBLIOGRAPHIES
BOOK CATALOGS
BOOK LISTS
BOOK REVIEWS
BOOKS
BULLETINS
CLASS NEWSPAPERS
COMPUTER PROGRAMS
CONFERENCE REPORTS
CURRICULUM GUIDES
DIRECTORIES
DOCTORAL THESES
ENCYCLOPEDIAS
GLOSSARIES
GUIDES
HISTORY TEXTBOOKS
INDEXES (LOCATERS)
LABORATORY MANUALS
LEADERS GUIDES
LIBRARY GUIDES
LITERATURE GUIDES
LITERATURE REVIEWS
MANUALS
MAPS
MASTERS THESES
NEWSLETTERS
NEWSPAPERS
PERIODICALS
PROGRAM DESCRIPTIONS
PROGRAMED TEXTS
PUBLICATIONS
RESEARCH PROPOSALS
RESEARCH REVIEWS (PUBLICATIONS)
RESOURCE GUIDES
SCHOOL NEWSPAPERS
SERIALS
SPEECHES
STATISTICAL DATA
STUDY GUIDES
TABLES (DATA)
TAPE RECORDINGS
TEACHING GUIDES
TEACHER DEVELOPED MATERIALS
TESTS (About 30 kinds of specialized tests)
TEXTBOOKS
THESAURI
YEARBOOKS

Beginning in mid-1974, each ERIC document was tagged with a code representing its form/type as part of the routine cataloging procedure. It is unclear at this time how this new coding procedure will affect computer searching.

If the ERIC indexing rules on page 10 were restated to be of use to the computer searcher, they would look something like this:

1. Choose descriptors from the Thesaurus of ERIC Descriptors exactly as they appear; computers can't correct misspellings.
2. Remember to identify any specific project, programs, etc. you are interested in.
3. Specify which descriptors have the most relevance to your topic and which are peripheral.
4. General information.
5. General information.
6. Be sure to include all the narrower terms (NT) that you are interested in, as well as the terms which describe your area broadly.
7. You may be able to locate some information on a topic even if it has not been the subject of a major work. It may have been covered as part of a larger topic.
8. Although the final use of the results of the computer search is important to keep in mind, it is not possible to put that idea into the search itself.
9. General information.
10. Keep in mind the checklist of indexable elements:

    *Population Concepts

    *Action Concepts and Material Concepts

    *Curriculum Concepts

    *Document Form/Type Concepts

CONCLUSION

To someone new to ERIC searching, the first negotiation and search process may seem difficult and time consuming. However, learning to construct a computer search is something like learning to drive a car. The first few times, there are so many things to remember that it seems impossible to concentrate on a destination. In a short while, though, the process becomes semi-automatic, allowing concentration on the desired results instead of on the steps necessary to reach those results.

To recap the steps in the process of computer searching the ERIC system:

1. Decide which data base(s) is/are the most appropriate for the search at hand.
2. Decide whether a computer search or a manual search is the most effective approach to the problem.
3. Refine the search question. State the question in terms of concepts or facets.
4. Choose ERIC descriptors and identifiers to define each facet of the search, keeping in mind the Boolean search strategy to be used by the computer.
5. Review the resulting citations and alter or amend the search strategy if necessary. If document yield is either too high or low, it may occasionally be necessary to re-negotiate the question with the requestor.

The result of a thorough computer search of the ERIC data base should be a complete bibliography on the topic specified. With the complete bibliography comes the problem of access to the documents identified in the search.

Any searcher should be prepared to include in the response to the requestor specific information on how journal articles have been cited and on how abstracted documents can efficiently be obtained. A high percentage of the citations are to journals in a local library collection or to ERIC microfiche. ERIC microfiche (documents with ED numbers) can be read in any library with an ERIC collection, or ordered according to instructions on page 40. Some information centers can supply ERIC fiche copies as an added service to computer searching. In some cases, though, the reference is more obscure. This calls for some ingenuity in obtaining a copy of the article or book. Many large libraries are a part of a network or interlibrary loan service that allows them to tap the resources of other libraries in their region. Ask the reference librarian at the nearest library how to use these services. Some state libraries or colleges/universities with library science interests have compiled statewide and/or regional union lists of serials that provide journal access information (e.g. alphabetic listing by journal name, the library/libraries that have the journal holding, and the initial acquisition date by each of the holding). Such sources should be consulted as the library geographically closest to the requestor possessing the desired journal(s) can be quickly identified.

If all else fails, there are commercial organizations that specialize in obtaining photocopies of obscure references. The reference librarian should be able to direct you to such an organization. Two sources are:

Information Unlimited, 31 Delmar Ave., Berkeley, Calif. 94708, (415) 841-5861;

Original Article Tear Sheet (OATS) Service, Institute for Scientific Information, 325 Chestnut St., Philadelphia, Pa. 19106, (215) 923-0460.

APPENDIX A: DATA BASES OF INTEREST TO EDUCATORS

AIM/ARM (Abstracts of Instructional and Research Materials in Vocational and Technical Education) is a consolidation of two previously separate journals--Abstracts of Instructional Materials in Vocational and Technical Education, (AIM), and Abstracts of Research Materials in Vocational and Technical Education, (ARM). AIM/ARM indexes instructional materials and curricula in vocational and technical education and the research materials which support them. There is purported to be very little overlap between this file and ERIC, especially since 1974. Material is indexed using the ERIC Thesaurus and the ERIC guidelines to indexing. All material funded by the Department of Occupational and Adult Education will be found in this data base. The material can be ordered in sets from the ERIC Document Reproduction Service. The material also will be found as a set in the complete collections of ERIC microfiche. AIM/ARM can be computer searched using Lockheed/DIALOG. For further information contact The Center for Vocational Education, Ohio State University, 1960 Kenney Rd., Columbus, Ohio 43210.

Exceptional Child Education Abstracts is prepared by the Information Center of the Council on Exceptional Children. It uses a subset of the ERIC Thesaurus as an indexing vocabulary. The file contains about 40% journal articles in addition to texts, conference proceedings, curriculum guides, monographs, research reports, administrative guides, bibliographies, and other pertinent documents. The primary focus of these resources is the education of the handicapped and gifted with emphasis on teaching methods, motivation,class placement, cognitive and psychological processes, testing, curriculum, and child development.

Some of the materials in this file may be looked up in the journals cited. Some may be ordered from ERIC. The remainder are available from commercial sources. The data base can be searched using Lockheed/DIALOG. For further information contact the Council for Exceptional Children, 1920 Association Dr., Reston, Va. 22091.

Psychological Abstracts (PA) provides nonevaluative summaries of the world's scientific literature in psychology and related disciplines. Over 800 journals, technical reports, monographs, and other scientific documents provide material for PA. The material is indexed using the Thesaurus of Psychological Index Terms. PA can be computer searched using Lockheed/DIALOG. For further information contact the American Psychological Association, 1200 17th St., N.W., Washington, D.C. 20036.

Dissertation Abstracts can be computer searched using the DATRIX II system. The searches are fed into the computer on the basis of keywords in dissertation titles. The data base contains over 430,000 doctoral dissertations--virtually every one accepted by accredited, degree-granting U.S. universities since 1861, plus many of those accepted in Canada. For further information contact Datrix II, Xerox University Microfilms, 300 North Zeeb Rd., Ann Arbor, Mich. 48106.

Education Index is a cumulative author subject index to educational material in the English language. Although mainly a periodical index, it also includes proceedings, yearbooks, bulletins, monographs, book reviews, and material printed by the United States Government. Education Index is not available for computer searching at the present time. It has,

however, been in existence since 1929, making it especially useful for educational history projects. It covers 200 journals in subject areas such as administration, pre-school, elementary, secondary, higher and adult education; teacher education; counseling and guidance; curriculum and curriculum materials. For further information contact the H.W. Wilson Company, 950 University Ave., Bronx, N.Y. 10452.

NTIS is a data base issued by National Technical Information Service of the U.S. Department of Commerce. It consists of unclassified government reports resulting from government sponsored research. The citations contain bibliographic information such as author and title, as well as abstracts, descriptor terms, and information on how to order microfiche copies. NTIS mainly covers science, engineering and mathematics, but also includes reports on behavioral and social sciences. NTIS can be computer searched using either SDC/ORBIT or Lockheed/DIALOG. For further information contact NTIS, 5285 Port Royal Rd., Springfield, Va. 22151.

The Smithsonian Science Information Exchange (SSIE) processes information on more than 100,000 research projects each year, in all areas of basic and applied research in the life and physical sciences. A recently developed system of computer assisted indexing now makes some 70% of the information available for computer searching. The SSIE file is of particular interest when trying to track down ongoing or recently completed research projects. SSIE can be computer searched using SDC/ORBIT. For further information contact the Smithsonian Science Information Exchange, Rm. 300, 1730 M. St., N.W., Washington, D.C. 20036.

ERCON file includes most of the material in the comprehensive

catalogs of the Library of Congress from 1965 to date, including titles from the National Program for Acquisitions and Cataloging. It is the world's most extensive machine readable data base of monographic literature, running to well over 1,200,000 items. It is useful in retrieving citations to commercially published material, as well as material from the better known university presses. It can be computer searched using SDC/ORBIT. LIBCON was developed by Information Dynamics Corporation in Reading, Mass.

NEXUS is a people bank. It is not a computerized literature retrieval service, but rather an attempt to connect people who need information with people who can provide it. Made possible by a grant from the Fund for the Improvement of Postsecondary Education, the service answers requests for information received by telephone between 1 and 6 p.m. EST. The phone number is (202) 785-8480. This is a good resource to try when all the others haven't panned out.

The two main commercial suppliers of on-line information retrieval are:

Systems Development Corporation (SDC)
2500 Colorado Ave.
Santa Monica, Calif. 90406

Lockheed Information Systems
D52-08, B/201
3251 Hanover St.
Palo Alto, Calif. 94304

APPENDIX B: EDUCATIONAL LEVEL DESCRIPTORS

Since February of 1975 the ERIC system has required indexers to assign one educational level descriptor chosen from List A to each of the documents where such a descriptor is appropriate. The indexer also may choose other more specific descriptors from List B to describe further the exact educational level.

List A (Mandatory)

° EARLY CHILDHOOD EDUCATION
Scope Note: Education provided by prekindergarten (nursery school, informal learning activities, etc.) and the primary units of elementary school (grades K-3).

°° PRESCHOOL EDUCATION
Scope Note: Learning activities and experiences provided for children before entering kindergarten (or grade 1 when kindergarten is not attended), usually between birth and 4 or 5 years of age.

°° PRIMARY EDUCATION
Scope Note: Education provided in kindergarten, grade 1, grade 2, and grade 3.

° ELEMENTARY SECONDARY EDUCATION
Scope Note: Formal education provided in kindergarten or grade 1 through grade 12.

°° ELEMENTARY EDUCATION
Scope Note: Education provided in kindergarten or grade 1 through grades 6, 7, or 8.

°°° ADULT BASIC EDUCATION
Scope Note: Education provided for adults at the elementary level (through grade 8), usually with emphasis on communicative, computational, and social skills.

°°° PRIMARY EDUCATION
Scope Note: (See above.)

°°° INTERMEDIATE GRADES
Scope Note: Includes the middle and/or upper elementary grades, but usually 4, 5, and 6.

°° SECONDARY EDUCATION
Scope Note: Education provided in grades 7, 8, or 9 through grade 12.

°°° JUNIOR HIGH SCHOOLS
Scope Note: Providing formal education in grades 7, 8, and 9---less commonly 7 and 8 or 8 and 9.

°°° SENIOR HIGH SCHOOLS
Scope Note: Providing formal education in grades 9 or 10 through 12.

°°° HIGH SCHOOL EQUIVALENCY PROGRAMS
Scope Note: Adult educational activities concerned with the preparation for and the taking of tests which lead to a high school equivalency certificate issued by the department of education in each state (e.g., General Educational Development program).

° POST SECONDARY EDUCATION
Scope Note: All education beyond the secondary level---includes learning activities and experiences beyond the compulsory school attendance age with the exception of adult basic education and high school equivalency programs.
(Before APR75, Scope limited to: Education beyond Grade 12 and less than the baccalaureate level.)

°° HIGHER EDUCATION
Scope Note: All education beyond the secondary level leading to a formal degree.

°°° JUNIOR COLLEGES
Scope Note: Providing 2, but less than 4, years of formal education beyond the secondary level---includes the terminal occupational program below the Bachelor's Degree and the 2-year, principally Bachelor's creditable, program.

Chronological age may often be used in determining the educational level of a population group.

CHRONOLOGICAL AGE	CORRESPONDING BROAD EDUCATIONAL LEVEL DESCRIPTOR
0-9	EARLY CHILDHOOD EDUCATION
0-5,6	PRESCHOOL EDUCATION
5-9	PRIMARY EDUCATION
5-12,13,14	ELEMENTARY EDUCATION
5-18	ELEMENTARY SECONDARY EDUCATION
9-12,13,14	INTERMEDIATE GRADES
12,13,14-18	SECONDARY EDUCATION
12-15	JUNIOR HIGH SCHOOLS
14,15-18	SENIOR HIGH SCHOOLS
Adult	ADULT BASIC EDUCATION
Adult	HIGH SCHOOL EQUIVALENCY PROGRAMS
Adult	POSTSECONDARY EDUCATION
Adult	HIGHER EDUCATION
Adult	JUNIOR COLLEGES

Grade level ranges may also, like age, be used to determine the appropriate educational level Descriptor to use. See conversion list below:

GRADE LEVEL	CORRESPONDING BROAD EDUCATIONAL LEVEL DESCRIPTOR
K-12	ELEMENTARY SECONDARY EDUCATION
K-8, 1-6, 1-8	ELEMENTARY EDUCATION
1-3	PRIMARY EDUCATION
4-6, 5-8	INTERMEDIATE EDUCATION
6-8, 7-8, 7-9, 7-10	JUNIOR HIGH SCHOOLS
9-12, 10-12	SENIOR HIGH SCHOOLS
*13-14, 14-16, 15-16	HIGHER EDUCATION

*When appropriate, use JUNIOR COLLEGES for grade level range 13-14.

List B (Optional)

Adult Basic Education
Adult Education
Adult Programs
College Bound Students
College Curriculum
College Freshmen
College Graduates
College Instruction
College Preparation
College Programs
College Students
Colleges
Community Colleges
Continuation High Schools
Doctoral Programs
Early Childhood Education
Elementary Education
Elementary Grades
Elementary School Curriculum
Elementary School Students
Elementary Schools
Elementary Secondary Education
Grade 1
Grade 2
Grade 3
Grade 4
Grade 5
Grade 6
Grade 7
Grade 8
Grade 9
Grade 10
Grade 11
Grade 12
Grade 13
Grade 14
Graduate Students
Graduate Study
Higher Education
High School Curriculum
High School Equivalency Programs
High School Graduates
High School Students
High Schools
Inservice Education
Intermediate Grades
Junior College Students
Junior Colleges
Junior High School Students
Junior High Schools
Kindergarten
Kindergarten Children
Masters Degrees
Middle Schools (= Grades 4-9 or some segment thereof)
Nursery Schools
Post Doctoral Education
Postsecondary Education
Preschool Children
Preschool Curriculum
Preschool Education
Preschool Programs
Primary Education
Primary Grades
Professional Education
Secondary Education
Secondary Grades
Secondary School Students
Secondary Schools
Senior High Schools
Special Degree Programs
Teacher Education
Undergraduate Study
Universities
University Extension
Upper Division Colleges

GLOSSARY

Abstract

In the ERIC system, a brief 200 +/- word narrative description of the subject content of a document. Abstracts are tersely written, avoiding non-information-bearing words and wasteful constructions. Each citation in RIE includes an abstract.

Annotation

A brief (no more than 50 words) notation of subject content. In the ERIC system annotations are written for journal articles (CIJE accessions) whose titles are not sufficient to adequately convey content.

Batch Processing

A procedure in which a number of transactions to be processed are accumulated and processed together. Usually they are sorted into order and matched sequentially against affected files.

Boolean Algebra

A system for symbolizing logical statements by operators, usually AND, OR, and NOT, from which relationships among statements can then be derived mechanically. Boolean Algebra is an algebra of classes and is considered a branch of symbolic logic. The notation permits the expression of conditional statements and statements of fact in symbolic form, and by means of prescribed operations allows arrival at valid conclusions. It is much in use in information retrieval to express the conditions of a computer search. It is named after the mathematician George Boole (1815-1864).

Broader Term (BT)

A Descriptor that is a member of a class that totally contains a smaller class (also represented by a Descriptor) within it. For example, BIBLIOGRAPHIES is a Broader Term to ANNOTATED BIBLIOGRAPHIES, which is referred to as a Narrower Term in this context. Broader

and Narrower terms have a genus-species relationship.

Central ERIC (CERIC)

The organizational unit within NIE responsible for the ERIC network, its budgeting, funding, planning, program development, monitoring, policy setting. All ERIC contractors (e.g., ERIC Facility, EDRS, Clearinghouses, CIJE Contractor, etc.) report to Central ERIC.

CIJE

Current Index to Journals in Education. A monthly guide to the periodical literature covering over 700 major education and education-related publications. It includes a main entry section with annotations, and is indexed by subject, author, and journal contents.

Clearinghouse

A contractor within the ERIC network that takes responsibility for the acquisition and processing of materials in one of the major areas of the field of education, e.g., Higher Education, Languages, Tests, etc. ERIC Clearinghouses have traditionally been located within non-profit institutions such as universities; the exact number (now at 16) varies with the shifting needs of the educational community.

Current Awareness Search

See "SDI".

Data Base

A file of data, usually in machine-readable language.

Descriptor

A generic word for meaningful terms or short phrases which can be chosen from a defined vocabulary for the purpose of describing/characterizing/indexing the subject content of a document.

Documents

Research papers, speech texts, studies, dissertations, conference reports, curriculum studies, etc., that have been put into the ERIC system.

EIC

Educational Information Consultant. An educational specialist who receives, processes, and fulfills client requests for information needed to resolve specific curricular, instructional, and administrative problems.

ERIC Document Reproduction Service (EDRS)

The ERIC contractor responsible for the microfiching of all documents, the handling of standing orders (subscriptions) for microfiche, and the handling of on-demand orders for both microfiche and hard copy. Receives documents and data for this purpose from the ERIC Facility.

ERIC Processing & Reference Facility

The central computerized facility which accepts data from the ERIC Clearinghouses, edits and keys the data, and builds, maintains, and produces various products from the data base. A wide variety of supporting functions are also performed, e.g., acquisitions, lexicography, data conversion, reference, tape distribution, forms control, scheduling.

Facet

Term or group of terms which express one aspect of the search topic.

Hard Copy

A paper copy of a document; usually a full-size (100%) reproduction of the original done via Xerox or similar process, though reduced size two-up copies may also be made.

Identifier

An index term for a specific entity, e.g., project, legislation, person, place, organization, coined term, acronym, equipment, etc. There are ERIC guidelines for the construction of Identifiers, but they are not formally controlled, defined, and structured as Descriptors are. Identifiers are intended to provide additional specialized indexing depth covering the multiplicity of specific entities met with in documents. They can be made to appear in the printed RIE indexes by designating them as Major index terms.

Indexing

The process of assigning words or terms to documents in order to describe their subject content for purposes of subsequent retrieval.

Major Descriptor

A Descriptor representing one of the major concepts contained in a document. Major Descriptors appear in the published indexes; all other Descriptors are, by definition, "Minor". In order to restrict the size of published indexes, no more than five (5) Descriptors may be designated as Major. A Descriptor (or Identifier) is Major or Minor only in the context of a particular document where it is being used and not inherently. An * is used to denote a Major Descriptor.

Manual Search

Examination by hand of the annual and monthly issues of Resources in Education and Current Index to Journals in Education for information on a given topic.

Microfiche

A 4" x 6" (105 mm x 148 mm) flat sheet of film, containing reduced images of document pages. ERIC prepares microfiche for all Level I and II documents announced in RIE, using the COSATI/NMA standard (24X reduction; 98 frames in a 7x14 grid). Microfiche may be made of silver, diazo, or vesicular film. A microfiche reader or reader-printer is required to read the page image.

Minor Descriptor

A Descriptor assigned to a document and appearing in the printed Resume and in the machine (computer) record, but not in the subject indexes of RIE. See also "Major Descriptor".

Narrower Term (NT)

A Descriptor that is a member of a class totally contained in a larger class also represented by a Descriptor. For example, the term ANNOTATED BIBLIOGRAPHIES is said to be a Narrower Term to BIBLIOGRAPHIES because an annotated bibliography is always a bibliography. BIBLIOGRAPHIES is then referred to as a Broader Term in this context.

On Line System

A system in which peripheral devices are in direct and continuing communication with the central processor of the computer. With an on line system, interaction between computer and searcher during the search process allows immediate feedback of results and immediate modification of the search request when desired.

Related Term (RT)

A term that is conceptually related in some way to another term; each term is thereby a "Related Term" of the other. Related terms may be close in meaning, may have the same Broader Term, may be related in usage or application, and may have a part-whole relationship.

Relevance

The number of documents/accessions retrieved in a search that are

relevant to the original question divided by the total documents/ accessions retrieved. A ratio used as a measure of the extent to which the search retrieved solely good "hits". Synonymous with "Precision".

Resume

A compressed document description including cataloging, indexing, and abstracting data; a surrogate for the document itself. The term resume is used for this concept within the ERIC system; other systems describe their basic record variously as an abstract, digest, precis, brief description, announcement, record.

Retrieval

The process of identifying, locating, and securing research and development information.

Retrospective Search

An examination of the entire data base since its inception, on a given topic.

RIE

Resources In Education. A monthly journal of abstracts announcing recently completed research reports, descriptions of projects and outstanding programs, and other documents of educational significance. It is indexed by subject, author, and institution.

Scope Note (SN)

A brief note explaining the intended usage of a Descriptor. Used to restrict usage or to clarify a Descriptor which may have alternative meanings. Not intended to be a formal definition.

SDI

An acronym for selective dissemination of information, a method of alerting people to the most recent reports or articles of potential interest in a date file.

Search

A systematic attempt to identify documents with some well defined

characteristics. Applies to both manual and computer inquiries.

Search Negotiation

The method by which the searcher and the requestor discuss and define the topic to be covered in the search; the type, format, cost, and amount of information desired; and the amount of time necessary to complete the search.

Search Strategy

The logic of a particular inquiry; the demands that a search makes on its potential output. A search strategy is usually exemplified by a series of index terms arranged in groups and interconnected by logical operators, e.g., (DRINKING) AND (ALCOHOLIC BEVERAGES). A document in a data set must meet the specifications of a search strategy in order to be an output of the search. Search strategies may be "tight" and geared for retrieval of a small number of highly relevant items, or they may be "loose" and geared for comprehensive output of anything that even touches on the subject.

Set

Any grouping of items of interest.

Text Search

Computerized examination of the records in the data base for the presence of a given word or combination of words (character string).

Thesaurus

A collection of words or terms used to classify, index, store, and retrieve information in a data bank. The terms serve as labels. They usually are Descriptors, keywords, or data elements found in the text or data being indexed. The thesaurus may be an alphabetized word list or it may be hierarchically structured into specialized fields, subareas, or detailed subject matter. The entries may be single words or multiple words. When the references are cited along with the thesaurus, it becomes an index.

Thesaurus of ERIC Descriptors

A structured vocabulary of over 7,000 educational terms called Descriptors used to index and enter documents into the ERIC system and to assist users in searching the system.

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To Order ERIC Documents

Documents with ED numbers in the bibliography may be ordered from ERIC. Send a check for the purchase price, plus 18¢ postage for each publication ordered, to: ERIC Document Reproduction Service, P.O. Box 190, Arlington, Virginia, 22210. Always order by ED number. Prices of documents are based on the number of pages:

Pages	Microfiche	Hardcopy
1-25	76¢	$1.58
26-50	76¢	1.95
51-75	76¢	3.32
76-100	76¢	4.43
101-125	76¢	5.70
126-150	76¢	6.97
151-175	76¢	8.24
176-200	76¢	9.51
201-225	76¢	10.78
226-250	76¢	12.05
251-275	76¢	13.32
276-300	76¢	14.59
301-325	76¢	15.86
326-350	76¢	17.13

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